

of a structural differentiation of the shell-substance, rendered pliable by a possible digestive action of the snake's œsophagus or buccal glands. This idea, however, is at variance with the fact that for the second shell (Fig. ii.) the chief lines are longitudinal, and the lesser, so far as they can be recognised, transverse. Of the whole series of lines, the longitudinal and longitudinally spiral are much the more marked, the lesser of the transverse series being much feebler and often incomplete—so much so that they mostly present the appearance of mere superficial scratches, visible only in certain lights, which, by thinning the shell, facilitate its distortion without breakage under pressure. Over the flattened area, however, they become actual "cracks," breaking clean through.

The question thus arises whether the main lines of fracture, if predetermined by shell-structure, may not involve the bird's oviducal wall, or whether the whole result may not be the work of the hypapophyses, under a co-ordinated muscular action of the snake's œsophagus, and it becomes necessary to inquire whether the rotation within both this and the pigeon's oviduct may not be a variable process, especially when it is found that in the shell of Fig. i., which is spirally fractured, there are three longitudinal lines recognisable (*Δ*) though of variable extent.

The most conspicuous feature of the main fracture-lines is their regular recurrence and intersection at right angles—*i.e.* they are essentially cancellous. The regular recurrence of the hypapophyses suggest an obvious association with them, but this can only be determined on the death of the snake. If, as seems most likely, the distances between these and the fracture-lines will be found identical, there will remain no question as to how the latter arise. Spiral rotation of the egg beneath the anterior hypapophyses might well produce, under pressure, the spiral and transverse lines of both Figs. i. and ii. Kathariner's description of the condition of the parts, which gives us for each an elastic pad with a central stiletto, are just such as would be required to produce the result observed; and if this be due to the action of the anterior hypapophyses alone, the presence of the lines over the flattened area will be explained, by their being formed before the cutting "teeth" are brought into action.

The regularity of the fractures would seem to favour this view, and if it be correct, one can only marvel at the exquisite delicacy of the muscular apparatus concerned and its co-ordinate activity; but there still remains a difficulty in the case of the longitudinal lines, as it is hardly conceivable that the snake's œsophagus, distensible though it is, could accommodate so large an egg transversely placed.

The slight extent to which, where most fully fragmented, pieces of the shell may break away (as at *b*, Fig. ii.), is a striking feature, and it becomes the more interesting by Kathariner's discovery that the head of the intestine is so modified that it would oppose their passage should they reach it. Both the main longitudinal and spiral lines, as has been said, can be traced into the flattened shell-area, despite the fragmentation of that, and this would seem to justify the belief that the expulsion of the shell-contents must be a slow process, an inverted peristalsis, taking place during the egestive act.

The whole matter bristles with interest and suggestiveness. Thanks to Dr. P. L. Sclater, I am assured the shells which may yet be cast up by the snake now living in the Zoological Gardens, and the carcass of the animal when dead, for the further study of detail. I cannot, however, refrain from bringing to the notice of the scientific public a topic so fascinating as that herein dealt with, since it is one of those exquisite things which only organic nature reveals, and that but rarely.

G. B. HOWES.

THE LIVERPOOL MUSEUM AND PROGRESS.

OUR attention has been directed to a correspondence now taking place in the Liverpool press, *à propos* of a recent meeting of the Biological Society, at which questions were raised as to the disposal of space in the newly-erected extension of the city Museum and the re-arrangement of the collections which must thereby ensue. The subject was introduced by Mr. Isaac Thompson, a past president, and continued at length by Prof. Herdman, in his capacity as the founder and leader of the Liverpool Biological School; and the undisguised theme was a protest against the non-communicativeness of the Museum Director and his committee of management, as to their intentions for the future development of their work. These gentlemen, it appears, who, with the sole exception of the Director himself, are in no way scientific, do not choose to consult Prof. Herdman and his co-workers, by whose long years of devoted labour the Liverpool School of Biologists have come to occupy a foremost position among the schools of the United Kingdom, more especially in matters pertaining to the fisheries and of economic importance. The claim which the local scientific men now raise is that their body shall be adequately represented on the Museum Board, and that immediate provision shall be made by this Board for the establishment of collections bearing on the nature and progress of oceanographic research and the fisheries, as more particularly representing the Liverpool area, regarded as a centre of local activity. And they also desire the display of objects of local interest, which shall in some measure reflect the latest advances in our knowledge of nature's operations.

The movement has been immediately taken up by the Liverpool geologists, who have also held a meeting of protest; and the general concern on the part of the combined Liverpool natural history societies is, as to whether the *régime* of the past, under which the Museum, controlled by persons mostly destitute of knowledge and experience of scientific affairs, shall remain a general emporium, having for its object the vain endeavour to fulfil the functions of a great central national museum, or whether it shall be made the centre of accumulation and display of all natural objects of local interest, supplemented only by such others as shall mark, in more especially its philosophic and educational aspects, the groundwork and recent progress in the natural history sciences. General collections from afar and costly *rarissimæ* will be forthcoming so long as the exploring Liverpoolian and the enthusiastic amateur exist, while the Directorate cannot be denied the power of purchasing such things, within reason, when so minded. It is with the work-a-day aspect of the Museum, as a rate-supported institution, that advancement is now desired, and most assuredly the latter of the afore-mentioned courses is, for this, the right one, as it is that dictated by general progress in all that pertains to museum work throughout the country, and by common sense. And if this be so, the members of the Liverpool Biological Society, the older and more experienced of whom, under Prof. Herdman's guidance, have become universally recognised experts, having by their labours earned, as loyal citizens, a right of control, constitute a very suitable and competent body of men available for consultation, in itself the first necessary step for the proper strengthening of the Director's hands, if he is to be free and efficient as chief administrator.

Z. T. GRAMME.

M. ZÉNOBE THEOPHILE GRAMME, who died last week at the age of seventy-four, was one of the pioneers of electrical engineering. He was born in Belgium in 1826, and was brought up as a carpenter; a taste for mechanics led him to attend some scientific

lectures at Liège, and subsequently he came to Paris and entered the "Alliance" factory as a workman. At this factory were built dynamos and arc lamps for lighthouse purposes, and here, as well as at the workshops of Ruhmkorff, where he also worked, Gramme managed to obtain a mastery of the principles of electric currents. The development of the dynamo, although it proceeded rapidly after the discovery of magneto-electric induction by Faraday, had not at that time attained a sufficiently high degree of perfection to give the machine then made any great industrial importance. In 1870, a few years after the discovery of self-excitation by Wilde, Gramme invented the ring armature which has since borne his name. This type of armature had been practically invented before by Pacinotti, a student at Pisa University; but Pacinotti's invention was before its time, and failed in consequence to obtain the recognition it deserved. It was reserved for Gramme, in re-inventing the ring armature, to produce a dynamo which rapidly obtained great commercial importance.

An interesting fact in connection with Gramme's armature is that the English patent was quite inadequate for so important an invention. The reason of this was that at the time the final specification was drawn up Paris was besieged, and Gramme's English agents were unable to obtain all the information they required. Gramme's machine was self-exciting, and combined good commutation with good lamination of the armature core. Also it is noteworthy that, at a time when the principles of the magnetic circuit were not understood, and when it was consequently impossible to design a dynamo mathematically, Gramme's machine had a fairly well proportioned magnetic circuit. Gramme had, without doubt, the engineering mind which is able to feel instinctively whether a machine is well designed or not. Gramme's machines were conspicuous at the Exhibition at Vienna in 1873, at Philadelphia in 1876, and at Paris in 1878 and 1881, and probably owe their success as much to the energy with which they were introduced to the world as to their great intrinsic merits.

Gramme was an Officer of the Legion of Honour and a Chevalier of the Order of the Iron Crown of Austria. In 1897 he was made a Knight Commander of the Order of Leopold, and a banquet was given in his honour at Brussels to celebrate the occasion. He died at his home, near Paris, on January 20, and was buried in the cemetery of Père Lachaise on January 23.

NOTES.

IN consequence of the lamented death of Her Majesty the Queen, and as a sign of mourning, all the meetings of scientific societies announced for the latter half of last week and the whole of this week have been postponed.

THE Amsterdam Genootschap ter Bevordering van Natuur-, Genees- en Heelkunde has awarded the Swammerdam gold medal for 1900 to Prof. Dr. C. Gegenbaur, of Heidelberg. This medal was instituted by the Genootschap in 1880, to be awarded every ten years to the person who in those years made important researches in the sciences cultivated by Swammerdam. It was awarded for the first time, in 1880, to Prof. Dr. C. Th. von Siebold; and the second time, in 1890, to Prof. Dr. Ernst Haeckel.

WE have with deep regret to record the death of Dr. Walter Myers, which took place on January 20 at Pará from yellow fever. It will be remembered that Drs. Durham and Myers went out last June for the Liverpool School of Tropical Medicine to study yellow fever. Both these gentlemen fell victims to their devotion to science, and the latter unfortunately lost his life. The world can ill afford to lose a man of Dr. Myers'

stamp, for not only did he show great promise as a scientific worker, but he had the courage and singleness of purpose to go out in the cause of science and humanity to study a very infectious and fatal disease. Many have courage to face bullets in a moment of excitement, but not all have the nobler courage to face an insidious disease with the coolness and nerve necessary for scientific inquiry.

Science announces that Dr. H. C. Bumpus, professor of comparative anatomy at Brown University, and director of the biological laboratory of the U.S. Fish Commission at Woods Holl, has been appointed curator of invertebrate zoology and assistant to the president in the American Museum of Natural History, New York City. The office of assistant to the president, Mr. Morris K. Jesup, is an important executive position, as the Museum has no scientific director. It was created last year and was filled by Prof. H. F. Osborn, who has resigned in order to devote himself more exclusively to research in vertebrate palaeontology. A further reorganisation of the staff of the Museum has been made. A department of mineralogy has been formed, with Dr. L. P. Gratacap as curator, while Mr. R. P. Whitfield remains curator of geology, with Dr. E. O. Hovey as associate curator. Prof. Franz Boas and Dr. Marshall H. Saville have been made curators, the former of ethnology and the latter of Mexican and Central American archaeology, though Prof. F. W. Putnam retains the head curatorship in the department of anthropology. In the department of mammalogy and ornithology, Mr. Frank M. Chapman has been made associate curator.

A DISCUSSION on the occurrence and detection of arsenic in manufactured products has been arranged for the next meeting of the Society of Chemical Industry, to be held on February 18.

THE Anatomical Society has undertaken to supply the slips requisite for indexing the literature in human anatomy published in Great Britain and Ireland for the International Catalogue of Scientific Literature, which has been set on foot under the auspices of the Royal Society. For this purpose a committee has been appointed, consisting of Prof. Thane, Dr. Arthur Robinson, and the secretary of the Society (Dr. A. Keith).

AT the recent conference of German biologists, held at Berlin, says the *Athenaeum*, a resolution was passed calling the attention of the Imperial Government to the importance of establishing five floating stations on the Rhine for the purpose of biological investigation. Great stress was laid on the practical advantages which pisciculture would derive from these establishments, and it was resolved that if the Government failed to provide the necessary funds, an appeal should be made to the States of Baden, Bavaria, Alsace-Lorraine, Hesse and Prussia.

THE lectures at the Royal Institution of Great Britain will be resumed on Tuesday, February 5, when Prof. J. A. Ewing will deliver his third lecture on "Practical Mechanics (Experimentally Treated)—First Principles and Modern Illustrations"; and on Wednesday, February 6, Prof. R. K. Douglas will deliver his second lecture on "The Government and People of China." The Friday Evening Discourse, on February 8, will be delivered by Prof. G. H. Bryan, his subject being "The History and Progress of Aerial Locomotion."

WE learn from the *Times* that the question of the protection of Stonehenge from further damage was discussed at a recent meeting of the council of the Society of Antiquaries, when a resolution was passed offering to co-operate with the owner of this ancient monument, Sir Edmund Antrobus, for its protection, and suggesting that a scheme might be arranged with that object in view. A copy of the resolution has been forwarded to Sir Edmund Antrobus, and his reply will be considered at the